VIRTUAL SOCIAL INTERACTIONS
5th Edition

30 June – 1 July
ONLINE!

Programme & Abstracts

University of Glasgow

SOCIAL ROBOTS

erc

SoBA Lab
SOCIAL BRAIN IN ACTION

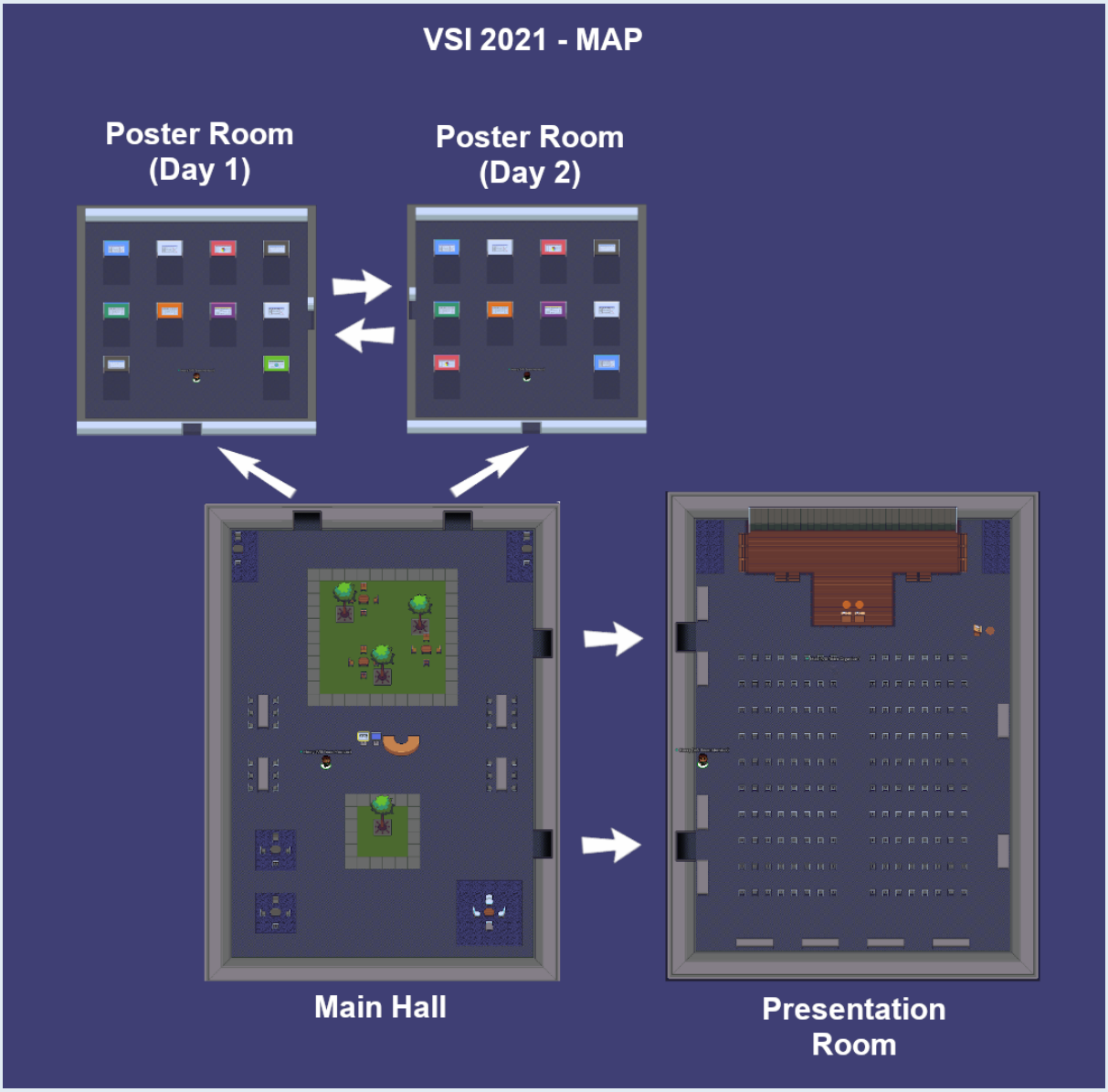
Important Scheduling Info

UTC										
+1	+2	+5:30	+8	+9	+11	-7	-4	+0	Wednesday, June 30	Thursday, July 1
LON	BER	MUM	SIN	TOK	SYD	LA	NY	GMT	Event	Event
8	9	12:30	15	16	17	0	3	7:00	7:55- Welcome to VSI	
9	10	13:30	16	17	18	1	4	8:00	KEYNOTE 1 - Leo Schilbach	INTERACTIVE WORKSHOP - Guido Orgs
10	11	14:30	17	18	19	2	5	9:00	BREAK	KEYNOTE 3 - Sylvia Pan
11	12	15:30	18	19	20	3	6	10:00	Paper Session 1	Paper Session 5
12	13	16:30	19	20	21	4	7	11:00	Posters 1	Posters 2
13	14	17:30	20	21	22	5	8	12:00	Paper Session 2	Paper Session 6
14	15	18:30	21	22	23	6	9	13:00	BREAK	BREAK
15	16	19:30	22	23	0	7	10	14:00	Paper Session 3	Paper Sesion 7
16	17	20:30	23	0	1	8	11	15:00	KEYNOTE 2 - Kersin Dautenhahn	KEYNOTE 4 - Stacy Marsella
17	18	21:30	0	1	2	9	12	16:00	Paper Session 4	Paper Session 8
18	19	22:30	1	2	3	10	13	17:00		Wrap up

Please be sure to carefully check the appropriate time of your presentation – we have used UTC (Coordinated Universal Time) throughout, as we have speakers and poster presenters from around the world joining us. Any questions? Please get in touch with us at VSI2021glasgow@gmail.com!

UTC	BST	CEST	AEST		WEDNESDAY 30 JUNE			THURSDAY 1 JULY
7:55-8:00AM					Opening Remarks			
8:00-8:20AM	9AM	10AM	6PM		KEYNOTE 1 - Leo Schilbach			LIVENESS/PERFORMANCE
8:20-8:40								WORKSHOP - Guido Orgs
8:40-9:00								
9:00-9:20AM	10AM	11AM	7PM		BREAK			KEYNOTE 3 - Sylvia Pan
9:20-9:40								
9:40-10:00								
10:00-10:20AM	11AM	12PM	8PM	Paper Session 1	Cirillo		Paper Session 5	Cross
10:20-10:40					Müller			Crone
10:40-11:00					Heyselaar			Caruana
11:00-11:20AM	12PM	1PM	9PM		POSTERS			POSTERS
11:20-11:40								
11:40-12PM								
12:00-12:20PM	1PM	2PM	10PM	Paper Session 2	Parenti		Paper Session 6	Fotiade
12:20-12:40					Buck			Wahn
12:40-1:00					Arias			Strasser
1:00-1:20PM	2PM	3PM	11PM		BREAK			BREAK
1:20-1:40								
1:40-2:00								
2:00-2:20PM	3PM	4PM	12AM	Paper Session 3	Schmitz		Paper Session 7	Zonca
2:20-2:40					McKenna			Clements
2:40-3:00					Czeszumski			Scattolin
3:00-3:20PM	4PM	5PM	1AM		KEYNOTE 2 - Kerstin Dautenhahn			KEYNOTE 4 - Stacy Marsella
3:20-3:40								
3:40-4:00								
4:00-4:20PM	5PM	6PM	2AM	Paper Session 4	Trzmielewska		Paper Session 8	Lisi
4:20-4:40					Hogenhuis			Bardy
4:40-5:00					Saund			Verpaalen
								CONCLUDING REMARKS

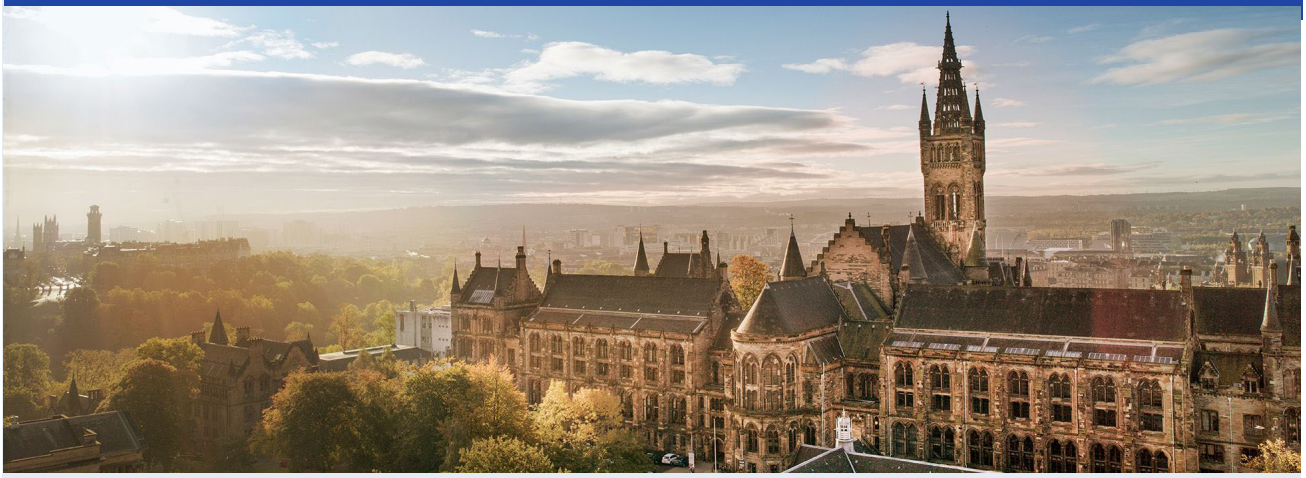
Map of Gather VSI Conference Space



When you enter the Gather space (please see link from EventBrite email, or point your browser here: https://gather.town/app/bRpMtRWLfkF3WVME/VSI%202021), you will land in the Main Hall. Please use your arrow keys to navigate to the Poster Rooms and the Presentation Room. All attendees at the talks should navigate to the presentation room and position your avatar at a seat in the audience. You can then join the Zoom meeting at the appropriate time following the prompts on your screen. All speakers should have had the chance to test walking to the stage and joining the zoom meeting before their scheduled talk time, but please get in touch with any of the organisers with questions. Furthermore, one of the conference organisers will aim to be on hand at the concierge desk in the Main Hall (the orange macaroni shape on the map above), so walk on over and ask any questions – we'll be happy to help!

Last but not least, we encourage all attendees to check out the space and familiarise themselves (at least a little bit) with Gather before the meeting begins, in order to maximise your experience of VSI 2021.

Welcome!



We would like to extend a warm welcome to all delegates to the 2021 edition of the Virtual Social Interaction workshop. We were so looking forward to welcoming you all to Glasgow, in person, in July of 2020 to take part in an in-person workshop as originally planned. When COVID struck, we thought postponing for a whole year was erring on the side of extreme caution… Of course, with the benefit of hindsight, that plan now appears perfectly foolish, as international (and even national) travel continues to be fraught with uncertainty and risk.

VSI is traditionally held every other year, but the last time this wonderful research community met to discuss research findings on the cutting edge of psychology, computer science, social robotics and cognitive science was December 2018. We are grateful to our keynotes, speakers, and poster presenters who have shown great enthusiasm for VSI 2021, as well as patience for our shift to an online meeting. Perhaps it seems natural and obvious that those of us studying virtual social interactions would have no qualms with a virtual meeting, but in reality, we've heard from many of you that the in-person VSI meetings are always preferable to virtual gatherings, so let's hope this year's meeting is a one-off.

To foster diversity, we invited both senior and starting researchers as speakers from a wide variety of disciplines. The workshop features an eclectic mix of keynote lectures, talks and poster presentations and will provide students, postdoctoral and senior researchers the opportunity to discuss their latest research on the border between social neuroscience and social robotics in an integrative manner. While we might not be able to welcome you to bonnie Scotland in person, we hope you enjoy these pictures of our beautiful campus and the Scottish Highlands, and definitely plan a visit to this special part of the world whenever it is safe to do so. In the meantime, we hope you find this two-day workshop stimulating and enjoyable!

Organisers:
Emily S. Cross, Terry Goetz, Henry Powell & Maki Rooksby – University of Glasgow

Programme – Day 1 – Wednesday, 30 June

ALL TIMES LISTED ARE IN UTC!! Please refer to time zone figure under 'Important Info' on Page 2!!

07:55-08:00 Welcome and Introduction: Emily Cross, Glasgow/Macquarie Universities

08:00 – 09:00 **Keynote 1**
Leo Schilbach
Max Planck Institute for Psychiatry, Munich (Germany)
Behavioural and neural mechanisms of social interaction: New developments in social neuroscience and implications for the study of psychiatric disorders

09:00 – 10:00 *BREAK*

10:00 – 11:00 **Paper Session 1 : Social Perception, Evaluation & Interaction**
Giusy Cirillo
Aix-Marseille Université (France)
Using social robots to explore between-participant conceptual alignment in joint word production

Barbara Müller
Radboud University Nijmegen (Netherlands)
Non-verbal mimicry decreases resistance during interactions with intelligent virtual agents

Evelien Heyselaar
Radboud University Nijmegen (Netherlands)
Linking theory of mind in human-agent interactions to validated evaluations

11:00 – 12:00 **Poster Session 1**
Please assemble at the VSI Gather Poster Space

12:00 – 13:00 **Paper Session 2 : Social Cues & Methods of Research**
Lorenzo Parenti
Istituto Italiano di Tecnologia (IIT; Italy)
Virtual cues can be social cues: insights from a social decision-making paradigm

Bryony Buck
University of Nottingham (UK)
Virtual communication behaviour with and without hearing impairment

Pablo Arias
Lund University (Sweden)
Influencing romantic decisions with real time smile transformations

13:00 – 14:00 *BREAK*

Programme – Day 1 – Continued

14:00 – 15:00

Paper Session 3: Behavioural and Brain Responses to Artificial Agents

Laura Schmitz
Aix-Marseille University (France)
Taking turns (with a computer): Joint goals affect attentional orienting

Peter McKenna
Heriot-Watt University (UK)
An online investigation of the effects of autistic traits and cultural orientation on robot expression interpretation

Artur Czeszumski
University of Osnabrück (Germany)
Coordinating with a robot partner affects action monitoring related neural processing

15:00-16:00

Keynote 2
Kerstin Dautenhahn
University of Waterloo (Canada)
What is embodiment? And why is it special to work with physically embodied agents and robots?

16:00 – 17:00

Paper Session 4: Paralinguistic Cues

Weronika Trzmielewksa
University SWPS, Warsaw (Poland)
Mimicking a virtual "person" makes you more social: A virtual reality study on how mimicry influences communion characteristics

Ann Hogenhuis
Utrecht University (Netherlands)
Domain-specific and domain-general neural network engagement during human-robot interactions

Carolyn Saund
University of Glasgow (UK)
Interpretations of virtual agent performances of metaphoric gestures differ across cultures

17:00

End of VSI Workshop Day 1

Programme – Day 2 – Thursday, 1 July

ALL TIMES LISTED ARE IN UTC!! Please refer to time zone figure under 'Important Info' on Page 2 for actual times in your part of the world!

08:00 – 09:00

Interactive Workshop
Guido Orgs
Goldsmiths, University of London (UK)
Analog Immersion: Liveness in Dance, Theatre and Performance Art

09:00 – 10:00

Keynote 3
Xueni Sylvia Pan
Goldsmiths, University of London (UK)
Virtual Social Interaction in VR

10:00 – 11:00

Paper Session 5: Exploring and Shaping Social Behaviour with Artificial Agents

Emily Cross
University of Glasgow (UK) & Macquarie University (Australia)
Social Robots for Social Good

Cassandra Crone
Macquarie University (Australia)
Combatting gender bias: Can embodied interactions in virtual reality work to reduce the gap?

Nathan Caruana
Macquarie University (Australia)
Can eye give you a hand? Using virtual interactions to examine the role of gaze during hand-cued co-ordination

11:00 – 12:00

Poster Session 2
Please assemble at the VSI Gather Poster Space

12:00 – 13:00

Paper Session 6: Human Likeness & the Uncanny

Ramona Fotiade
University of Glagsow (UK)
Journeys through the Uncanny Valley: Surrealism, spectrality and the future of AI

Basil Wahn
Leibniz University Hannover (Germany)
Humans share task load with a computer partner if (they believe that) it acts human-like

Anna Strasser
DenkWerkstatt Berlin (Germany)
Social roles for artificial agents

13:00 – 14:00

BREAK

Programme – Day 2 – Continued

14:00 – 15:00 **Paper Session 7: Morality**

Joshua Zonca
Italian Institute of Technology (Italy)
If you trust me, I will trust you: the role of reciprocity in human-robot trust

Michael Clements
Kings College London (UK)
Interacting with virtual characters: Developing an immersive way-finding task to measure trust

Marina Scattolin
Sapienza University of Rome & Italian Institute of Technology (Italy)
Reduced body ownership increases dishonesty: evidence from an immersive virtual reality study.

15:00-16:00 **Keynote 4**

Stacy Marsella
University of Glasgow (UK) & Northeastern University (USA)
Mental states, nonverbal behaviour and virtual humans

16:00 – 17:00 **Paper Session 8: Approaching and Aligning with Robots**

Matteo Lisi
Sapienza University of Rome & Italian Institute of Technology (Italy)
The role of sexual orientation and sexual prejudice against gay men in the regulation of virtual comfort-distance towards artificial agents

Benoit Bardy
University of Montpellier (France)
What your moves say about you when interacting with artificial agents

Iris Verpaalen
Radboud University Nijmegen (Netherlands)
The unfolding of resistance to persuasion in immersive virtual reality

17:00 – 17:15 **Concluding remarks and thanks**
Maki Rooksby, on behalf of the VSI Organizational Team

ABSTRACTS - KEYNOTES

Leo Schilbach - ***Behavioural and neural mechanisms of social interaction: New developments in social neuroscience and implications for the study of psychiatric disorders***
Max Planck Institute for Psychiatry, Germany

Social neuroscience studies the neurobiology of how people make sense of people. Due to conceptual and methodological limitations, the field has only more recently begun to study social interaction rather than social observation, which has become known as the development of a "second-person neuroscience" or an "interactive turn" in social neuroscience. These developments have helped to elucidate the behavioural and neural mechanisms of social interactions. Findings to date suggest that the neural mechanisms supporting social interaction differ from those involved in social observation and highlight a role of the so- called 'mentalizing network' as important in this distinction. Taking social interaction seriously may also be particularly important for the advancement of the scientific study of different psychiatric conditions, which are ubiquitously characterized by social impairments.

Kerstin Dautenhahn – ***What is embodiment? And why is it special to work with physically embodied agents and robots?***
University of Waterloo, Canada

My talk will discuss some fundamental issues of what it means for an agent to be embodied: properties that might be shared among software, virtual and physical agents, and properties that are special when working with physically embodied agents. I will provide examples of human-robot interaction research projects I have been involved in investigating the nature of embodiment, and applications of social robots where physical embodiment is key.

Guido Orgs – ***Analog Immersion: Liveness in Dance, Theatre and Performance Art***
Goldsmiths, University of London, UK

The rise of media technologies in the 20th century mark an important turning point for the performing arts: Fictional worlds are readily and – perhaps more convincingly – generated in film, on TV, video games and most recently VR than on stage. In response, contemporary dance, theatre and performance art as developed a powerful range of immersive aesthetic principles that foreshadow many of the design principles of augmented and mixed realities, such as blurring clear distinctions between performance and reality on the one hand, and spectator participation. In this workshop, we will explore some of these performative principles to identify the conditions for immersive live experience and compare their applications in live performance, and augmented and mixed realities.

In this workshop, we will explore performance making principles from choreography and acting based using simple everyday actions such as walking; no prior experience with dance or acting is required. Throughout the workshop we will freuqently switch roles between performers and spectators to experience liveness from both perspectives.

This workshop is part of NEUROLIVE, an interdiscplinary ERC-fiunded research project that studies how liveness is generated and experienced, combining artistic research in performance making and cognitive neuroscience.

Further specifcations:

- The workshop will not require any professional dance or acting skills

Xueni Sylvia Pan - ***Virtual Social Interaction in VR***

Goldsmiths, University of London, UK

Virtual humans are becoming an increasingly important part of our everyday lives, and the ultimate platform for virtual social interaction is Virtual Reality, with applications ranging from training, therapy, to entertainment, and more recently remote meetings. However, how we exchange social signals in real-life interaction is complicated and very often implicit. What are the risks of moving social interaction in VR? How do we ensure skills learnt in VR are transferable to real-life, in cases of training and therapies? My talk will use three studies in VR to try to address these questions.

Stacy Marsella – ***Mental states, nonverbal behaviour and virtual humans***

University of Glasgow, UK & Northeastern University, USA

People now regularly interact with facsimiles of people. Graphics-based virtual humans and social robots with anthropomorphic features and behaviours engage users using the same verbal and nonverbal behaviours that people use when interacting with each other. We have used these artificial social agents to help patients adhere to healthy behaviour, assess a user's mental state and train doctors to break bad news, to name a few applications. These embodied technologies exploit the fact that nonverbal behaviours convey information and powerfully influence face-to-face interaction. A nod can increase rapport between speaker and listener, facial expressions can suggest emotion and gestures can convey propositional content. From a research perspective, my interest is in computational models of how a person's internal mental states, what they are thinking, feeling, and intending to communicate, drive these behaviours. From an applied research perspective, I use these models to automate the generation of nonverbal behaviour to realize effective virtual character and social robot interactions with people in a range of applications, including health interventions, medical training, and entertainment. In this talk, I will discuss my group's work on virtual humans and the relation between internal mental states and nonverbal behaviour, with a specific focus on modelling metaphoric gestures in virtual humans.

POSTERS – DAY 1

Julia Ayache	Nottingham Trent University*, UK*	**Disentangling the multiple facets of empathy through interactive psychometrics**
Kohinoor Darda	University of Glasgow*, UK* / Macquarie University*, Australia*	**The Impact of Kinematics and Eye Contact on Action Perception in a Social Context**
Veronica Diveica	Bangor University*, UK*	**Establishing a Role of the Semantic Control Network in Social Processing: a Meta-analysis of Functional Neuroimaging Studies**
Noga Ensenberg	Hebrew University*, Israel*	**Do you see what I see? Individual differences in contextualized emotion recognition**
Christina Simoudi	Panteion University of Social and Political Sciences*, Greece*	**Smart conversational agents for the detection of dementia: A systematic review**
Emanuele Tidoni	University of Hull*, UK*	**The Processes Supporting the Perception of Social Robots**
Afroditi Tsourgiani	UCL*, UK*	**How data source influences the perception and uptake of algorithmic advice**
Olga Wudarczyk	Humboldt University zu Berlin*, Germany*	**Robots facilitate human language production**
Joni Zhong	The Hong Kong Polytechnic University*, Hong Kong*	**It is time to laugh: Learning Co-Occurrence of Laughter and Topics in Conversational Interactions**

POSTERS – DAY 2

Ionela Bara	Bangor University, *UK*	**Investigating the Role of Cognitive Control in Aesthetic Judgments**
Thomas Chen	Academy for Mathematics, Science, and Engineering*, US*	**Comparing Machine Learning Algorithms for Human Fall Detection in Real Time: Preserving the Health of Elderly Adults**
Matt Cornell	Critical Path, *Gadigal Country*	**Open Tab WIKI**
Laura Jastrzab	Bangor University*, UK*	**Is mental state attribution to robots based on human-likeness?**
Loriane Koelsch	GIPSA-lab*, France*	**Factors of variation of mere robotic presence effect**
Guy Laban	University of Glasgow*, UK*	**Protocol for a Mediated Long-Term Experiment with a Social Robot**
Alexander Leonhardt	Humboldt-Universität zu Berlin*, Germany*	**The impact of affective knowledge on the perception and evaluation of robot faces**
Doris Pischedda	Charité - Universitätsmedizin Berlin*, Germany*	**Who is my interlocutor? Partner-specific neural representations during communicative interactions with human or artificial task partners.**
Katie Riddoch	University of *Glasgow, UK*	**"Hit the Robot on the Head… with this Mallet" - Making a Case for the Importance of Open Questions**
Noelia Mejía Wille	Behavioural Science Institute, Radboud University*, NL*	**Choices, uncertainty and freedom threat**

Please note poster and talk abstracts are presented in alphabetical order by presenting author last name

Influencing romantic decisions with real time smile transformations
Pablo Arias
Lund University Cognitive Science, IRCAM, Sweden

The study of dyadic social interactions often relies on either the recording of free conversations or on the use of research confederates and scripted dialogs. On the one hand, the use of free conversations is useful to observe the conversational dynamics and behaviours that are involved in specific tasks. However, these studies are only correlational. On the other hand, experiments using scripted interactions or research confederates, are useful for experimental control, but limited to their low ecological validity. In this talk, I will present a new research paradigm, where we are able to manipulate participants' facial expressions in real time using digital signal processing algorithms. Specifically, I will present an experiment where we covertly manipulate participants' smiles in real time during a speed dating task. With this methodology, I will show how expressive alignment can influence romantic decisions and social dynamics in freely interacting participants. I will argue that this new methodology gives researchers the unprecedented ability to have high experimental control during free and unscripted social interactions.

Disentangling the multiple facets of empathy through interactive psychometrics
Julia Ayache
Nottingham Trent University, UK

Empathy is a research field that has captured considerable attention but remains scattered across affective and cognitive conceptualizations, leading to mixed findings considering its association with motor empathy. Characterized by a spontaneous tendency to mimic someone else's gestures, motor empathy is conceived as an innate ability, although recent findings have highlighted the role of motivational and control mechanisms involved in Self-Other distinction and emotion regulation processes. Affective and motor empathy are usually associated with phenomenological experiences of Self-Other overlap. In contrast, cognitive empathy, identified as a critical component for interpersonal motor coordination, is characterized by a sense of Self-Other distinction. Therefore, it is unclear how Self-Other overlap/distinction experiences are related to motor coordination and how emotion dysregulation processes are involved in this association. The present study investigated the association between affective and cognitive empathy and emotion dysregulation with motor empathy and Self-Other overlap/distinction. Participants (n=150) completed Self-reports assessing affective and cognitive empathy before executing a synchronization task with a virtual agent driven by the Haken-Kelso-Bunz model of coordination dynamics. Using a between-subject design, participants were either paired with a cooperative agent (shared goal) or a competitive agent (antagonist goal), and completed self-reports assessing emotion regulation abilities and perceived similarity/closeness with the agent. In line with previous findings, cognitive empathy was positively associated with motor synchronization scores and negatively with Self-Other overlap, especially when interacting with a competitive agent. Confirming the crucial role of the Self-Other distinction, affective facets of empathy associated with a lower sense of Self-Other overlap were also positively associated with motor synchronization performances. On the other hand, emotion dysregulation was associated with a greater sense of Self-Other overlap and was negatively associated with motor coordination. Contrary to previous findings, motor coordination did not elicit a greater sense of Self-Other overlap, questioning the ability of a virtual agent to foster social bonding. Finally, these results highlight a mismatch between the phenomenological experience of Self-Other overlap and motor coordination performances, paving the way for future investigations in clinical populations.

Investigating the Role of Cognitive Control in Aesthetic Judgments

Ionela Bara1, Richard J. Binney1, and Richard Ramsey2

1 Wales Institute for Cognitive Neuroscience, School of Psychology, Bangor University, Bangor, Wales, LL57 2AS, United Kingdom.
2 Department of Psychology, Macquarie University, Sydney, NSW 2109, Australia.

Aesthetic judgments dominate much of daily life by guiding how we evaluate objects, people and experiences in our environment. Neuroaesthetics is a fledgling field of research that aims to study the neurobiology of aesthetic judgments. One modestly studied aspect of neuroaesthetics is the extent to which automatic versus controlled processing is involved in aesthetic judgments. The study of automaticity is important because it can provide real insight into the structure of underlying cognitive systems, as well as how they differ across different domains, such as between aesthetic and non-aesthetic contexts. In the current pre-registered study, we aimed to examine whether a central cognitive load produces greater reaction time interference on aesthetic judgments relative to non-aesthetic judgments. In Experiment 1, participants (N = 92) completed both aesthetic and implied motion judgments using a 2-alternative forced choice (2-AFC) on paintings describing people or landscape, whilst holding in memory a single letter (low load) or six letters (high load). The results showed an effect of load type on reaction time, such that high load increased response times compared to low load. However, there was no interaction between the load type and the judgment type; instead, the confidence intervals for reaction time interference were almost entirely overlapping between judgment types. In Experiment 2, participants (N = 95) responded to aesthetic and implied motion judgments using a 2-AFC on both artworks and naturalistic photographs describing people or landscape, whilst keeping in memory a single letter (low load) or six letters (high load). Consistent to experiment 1, it was a clear effect of high load on reaction time response, however, no evidence for an interaction between load type and judgment type. Taken together, the current findings suggest that aesthetic and non-aesthetic judgments rely on a similar degree on automatic versus controlled processing and the operations of the central executive. Future studies will be required to probe the extent to which such similarities generalise to other types of aesthetic judgments.

What your moves say about you when interacting with artificial agents

Benoit Bardy
EuroMov Digital health in Motion, University of Montpellier, France

In this presentation, I will emphasize the informational nature of human coordination, together with its consequences for the understanding of how the way we move in a social context reveals who we are. The notion of Individual Motor Signature (IMS) will be presented, reducing to one low-dimensional variable the interaction of multiple degrees of freedom at various levels of the human body. A novel way to evaluate how these signatures are influenced, when interacting in a dyad or in a group, by morphological and movement similarities, emotional qualities, and social competences, will be introduced. We will present a recently developed digital architecture that modulates IMS in real-time during social interaction with artificial agents (avatars and robots), and we will show how this architecture can be used for the rehabilitation of patients suffering from mental and social disorders.

Virtual communication behaviour with and without hearing impairment.

Bryony Buck, Andrew McLaren, Graham Naylor
University of Nottingham, UK

Since the Covid-19 pandemic began, there has been a migration from face-to-face communication to conducting interactions online. Studies investigating 'zoom-fatigue' and virtual interaction acknowledge an added level of cognitive attention and exhaustion related to virtual interaction over face-to-face. Individuals with hearing loss are known to adapt their communication behaviours in challenging environments. However, little is known or understood about how people with hearing impairment use video calling platforms (Zoom, Skype, etc.). Using recordings of hearing impaired and normal hearing dyads conversing over Skype, we investigate how communication behaviour varies in virtual settings in relation to hearing loss, with respect to normal hearing and face-to-face conversations. Conversation dyads engaged in four conversations virtually from their own homes, mediated by an experimenter. Conversations were prompted by starter questions previously used with face-to-face dyads. OBS Studio was used to record video information of the pairs and single-channel audio information. Speech characteristics (e.g. signalling turn-taking, backchanneling and overlap) were extracted from audio recordings using pyannote-audio speech activity and overlap detection. Facial landmarks were identified from video recordings using OpenFace 2.0. These were used to determine facial orientation, position and facial expression activity of the interlocutors. Variation in visual and audio communication behaviours are considered with respect to participant's previous experiences of video calling software, technical readiness, behaviour, and hearing. We present a methodology for online data-collection and communication behaviour analysis, discussing the problems and successes encountered throughout. Data collection is ongoing. We present preliminary findings in relation to hearing loss, participant feedback, and prior communication experiences.

Can Eye Give you a Hand? Using virtual interactions to examine the role of gaze during hand-cued co-ordination.

Nathan Caruana
Macquarie University, Australia

Eye gaze processing has been intensely studied in the field of social neuroscience and autism given its assumed importance in the regulation of face-to-face interactions. This is because eyes play a critical role in processing and communicating information about one's mental states to others. Whilst this makes eye gaze an information-rich social signal, it also makes it potentially unreliable or 'noisy' since not all eye movements are intentionally communicative. Despite this, joint attention – the ability to attend to the same thing as a social partner – has predominantly been examined in the context of gaze-based interactions. In this study, we have created a novel paradigm that integrates the use of immersive virtual reality, eye-tracking and motion capture to investigate how human dyads utilize eye gaze during a cooperative point-based joint attention task where the use of eye gaze is non-essential to task success. Using this approach, we tested (1), whether the eye gaze of initiators offers a predictive signal during point-based joint attention, and if so, (2) whether responders use this information to facilitate their responsivity. We show that whilst eye gaze can sometimes provide predictive information which can facilitate response times to point-cued joint attention – this information was highly unreliable across trials and individuals. Interestingly, responders only benefited from predictive information conveyed by their partner's gaze if they overtly attended to the face when joint attention was initiated. These data highlight the importance of looking at the dynamics of multimodal, as opposed to unimodal, social coordination – and the need to adopt a much more comprehensive approach to the assessment of social responsivity in autism.

Comparing Machine Learning Algorithms for Human Fall Detection in Real Time: Preserving the Health of Elderly Adults

Thomas Chen
Academy for Mathematics, Science, and Engineering

As humans age, physical falls become more perilous for their health and can in some cases cause death. This aspect of ageing causes many elderly people to need aides or family members to stay with them and ensure that they do not become severely injured or be placed in an unhealthy situation. However, as artificial intelligence becomes more ubiquitous and seeps into many aspects of our lives, machine learning approaches that can aid elderly people in their movements and day-to-day lives present exciting opportunities. Particularly, in this talk, we explore the automated detection of human falls in real time, which enables mechanisms such as airbags to be dispatched to prevent tragic impacts. Because these computational approaches are far more efficient than any human-based mechanism, the technology we present has the ability to save lives. In the study, a publicly available dataset that entails 30+ subjects and 4+ fall types including fall forward, backward, left and right is employed. Furthermore, a set of 12 attributes were defined and provided as inputs to machine learning classifiers. We then compared various machine learning architecture, including most prominently the random forest ensemble model and the support vector machine. Both of these algorithms were able to detect the commencement of the "free fall" phase based on the external labeled factors included in the dataset. We also found that the decisions were made within a time frame that enabled the deployment of an airbag to cushion the fall. This talk highlights a key area of health and quality of life-enhancing computer-human interaction, especially geared towards more elderly humans. When robots or other autonomous objects are deployed in the real world and are fitted with these artificial intelligence algorithms as well as mechanisms for cushioning falls, the objective is to have a real impact on the lives of older folks.

Using social robots to explore between-participant conceptual alignment in joint word production

Giusy Cirillo
Laboratoire Parole et Langage (LPL), CNRS & Aix-Marseille University, Aix-en-Provence, France/
Institute for Language, Communication and the Brain (ILCB), Marseille, France

Once reserved to artificial intelligence research, humanoid robots are becoming an interesting tool for linguists and (neuro)psychologists to investigate the dynamics of speech processing in conversation. These 'social robots' allow us to study these mechanisms in a controlled experimental setting, while preserving a certain ecological dimension linked to the human-like aspect of these sophisticated machines.In this work, we used the Furhat humanoid robot as a partner in a joint picture-naming task to explore conceptual alignment in the production of spoken words. We developed an experimental design in which a human participant and the robot alternated in naming pictures belonging to different semantic categories (e.g., mammals, tools, fruit). The robot was programmed to give an unexpected, hyperonymic semantic category name instead of the expected basic-level name of the item (e.g., "mammal" instead of "cat") for a fixed subset of trials (i.e., five out of fifteen categories). Logistic regression models on participants' errors revealed that the participants progressively aligned themselves with the conceptual choices of the robot and started producing the atypical category names. Importantly, this was true for novel items, and more frequent for the pictures belonging to the same semantic categories as those of the items named with the category name by the robot. This phenomenon occurred very rapidly, possibly highlighting participants' automatic adaptation to the robot's atypical responses, while the amount of category names increased towards the end of the experiment, likely showing an additional effect of a more controlled, conscious conceptual alignment with the robot. In addition to these behavioral data, we will also present the results of an EEG experiment with the same setting and that we more recently ran to investigate conceptual alignment in terms of adaptative prediction, with a potential decrease in amplitude for ERP components related to prediction violation (e.g., N100, N400) over the course of the task. Overall, we would like to share with the public our experience of using social robots as conversational partners in joint language tasks. These human-like machines can potentially represent a way to explore in detail conceptual alignment affecting both speech production and perception (/prediction).

Interacting with Virtual Characters: Developing An Immersive Way-Finding Task To Measure Trust
Michael Clements
King's College London, UK

Trust is key to navigating social relationships. Typical techniques for measuring trust involve questionnaires or economic games, which lack a dimension of realism we expect in social interaction. We set to address this problem by using an immersive virtual reality (VR) setting to examine behavioural responses to agents of differing levels of trustworthiness. We built on the maze paradigm by Hale et al., 2018 by 1) adding ecological validity through the development of a cityscape scenery and a wayfinding task, 2) controlling for several character variables and 3) including interpersonal distance as a trustworthiness outcome measures. Participants who owned a VR system were recruited remotely, and subject to trust manipulation by reading two character sheets regarding two virtual characters, whom they would have the opportunity to consult in the virtual environment. This sought to establish one as 'trustworthy' and the other as 'untrustworthy', counterbalanced across participants and confirmed in the study proper by an Implicit Association Test (IAT). Character voices and appearance were selected on the results of a pre-study in order to best match them on trustworthiness. To examine trust responses, we measured participants' behaviour relating to their choices in the maze. This was followed by a post-test questionnaire regarding each character and including qualitative feedback. Differences were observed in the IAT, confirming that levels of trust for the two virtual characters were successfully manipulated. In the maze environment, we found that, while participants consulted both of these characters as frequently as each other, they would tend to consult the trustworthy character first; and overall, they tended to follow this character's advice more often. We found no difference in interpersonal distance between the participants and each of the two characters. The results seem to validate the use of the wayfinding task as a paradigm to measure trust, similar to earlier maze studies, and begins to ratify its use as a tool for investigating social interactions. From our feedback and results, we identify areas of development regarding the implementation of our virtual characters and the nature of our manipulations. Finally, we demonstrate a new procedure of remote online recruitment for virtual reality studies, and acknowledge conceptual and artefactual challenges to overcome in future recruitment.

Open Tab WIKI
Matt Cornell
Critical Path, Gadigal Country

The Open Tab project is a sharing of methodology and insights from artists working at the nexus of choreography and digital - in the form of a wiki.

"A wiki is a hypertext publication collaboratively edited and managed by its own audience directly using a web browser. A typical wiki contains multiple pages for the subjects or scope of the project and could be either open to the public or limited to use within an organization for maintaining its internal knowledge base." - https://en.wikipedia.org/wiki/Wiki

Initially, invited artists from across the Pacific and Asia region will meet in the Drill Hall (IRL and remotely) to establish OpenTab.wiki before it becomes publicly editable in late 2021.

This week-long wiki working bee will stress test a geographically distributed yet co-temporal residency model. We will be dancing and typing and talking, being physically digital, and on sunday the 18th from 14:00 - 17:00 we invite you to our open studio session supported by the DJing of Riana Head-Toussaint while we continue to populate http://OpenTab.wiki

Combatting Gender Bias: Can Embodied Interactions in Virtual Reality Work to Reduce the Gap?
Cassandra Crone
Macquarie University, Australia

Encouraging individuals to imagine what it might be like to be someone else (i.e., perspective taking) can improve prosocial behaviour, empathy, perceived self-other differences, and unconscious biases toward specific others, in particular toward those who are marginalised on the basis of group stereotypes. Virtual reality technologies can now allow us to further engage with this process – rather than simply imagining another's experience, one can encounter the first-hand experience of (temporarily) being an individual of a different gender, from a different age group or cultural background, or with a different socioeconomic status. Visually altering an individual's identity in such a way within virtual reality induces embodiment, an immersive perceptual illusion of body ownership. The effects of virtual embodiment on unconscious biases and associated behaviours have been investigated for race, age, and socioeconomic status, showing potential to produce stronger and longer lasting effects than traditional perspective taking methods. However, the question remains whether virtual reality perspective taking (VRPT) can be applied to gender. Moreover, the current scope of ecologically valid behavioural tasks and simulated task scenarios, although gradually expanding, remains limited. Accordingly, this research investigated the effects of embodying a gender-congruent (i.e., male embodied as male) or gender-incongruent (i.e., male embodied as female) avatar on gender bias during everyday interpersonal activities simulated in typically male-dominated domains. Study 1: Science, technology, engineering, and math (STEM) sectors consistently exhibit gender bias favouring men, which systemically contributes to women's reduced engagement and increased expectation for discrimination within STEM workplaces. We employed a simulated STEM interview, which included the rating and selection of male and female candidates, to assess whether VRPT could improve perceptions of female candidates during face-to-face hiring procedures where gender cannot be concealed. Study 2: Gaming industries are traditionally dominated by men in programming, software-engineering, and computer-science roles. Resulting stereotypes include beliefs that women in gaming are incompetent, attention-seeking, overly detail-oriented, and lacking in technical expertise. We employed a simulated performance evaluation of candidates within a fictional gaming company to assess whether VRPT would result in more equitable and less stereotyped ratings of female presenters. Taken together, results of these studies suggest that VRPT may have greater impact on males for modulating implicit gender bias. Markedly, findings also contribute to elucidating the nature of empathy pre- and post-VRPT and lay foundations for extending VRPT paradigms to include gender-diverse identities for use in research and applied settings.

Social Robots for Social Good
Emily S. Cross
University of Glasgow, UK & Macquarie University, Australia

Understanding how we perceive and interact with others is a core challenge of social cognition research. This challenge is poised to intensify in importance as the ubiquity of artificial intelligence and the presence of robots in society grows. This talk examines how established theories and methods from psychology and neuroscience reveal fundamental aspects of how people perceive, interact with, and form social relationships with robots. Robots provide a resolutely new approach to studying brain and behavioural flexibility manifest by humans during social interaction. As machines, they deliver behaviours that can be perceived as "social", even though they are artificial agents and, as such, can be programmed to deliver perfectly determined and reproducible sets of actions. This talk highlights work bridging social cognition, neuroscience and robotics, with important implications not only for social robot design, but equally critically, for our understanding of the neurocognitive mechanisms supporting human social behaviour more generally.

Coordinating With a Robot Partner Affects Action Monitoring Related Neural Processing

Artur Czeszumski
University of Osnabrück, Germany

Robots start to play a role in our social landscape, and they are progressively becoming responsive, both physically and socially. It begs the question of how humans react to and interact with robots in a coordinated manner and what the neural underpinnings of such behavior are. This exploratory study aims to understand the differences in human-human and human-robot interactions at a behavioral level and from a neurophysiological perspective. For this purpose, we adapted a collaborative dynamical paradigm from Hwang et al. (1). All 16 participants held two corners of a tablet while collaboratively guiding a ball around a circular track either with another participant or a robot. In irregular intervals, the ball was perturbed outward creating an artificial error in the behavior, which required corrective measures to return to the circular track again. Concurrently, we recorded electroencephalography (EEG). In the behavioral data, we found an increased velocity and positional error of the ball from the track in the human-human condition vs. human-robot condition. For the EEG data, we computed event-related potentials. To explore the temporal and spatial differences in the two conditions, we used time-regression with overlap-control and corrected for multiple-comparisons using Threshold-Free-Cluster Enhancement. We found a significant difference between human and robot partners driven by significant clusters at fronto-central electrodes. The amplitudes were stronger with a robot partner, suggesting a different neural processing. All in all, our exploratory study suggests that coordinating with robots affects action monitoring related processing. In the investigated paradigm, human participants treat errors during human-robot interaction differently from those made during interactions with other humans.

The Impact of Kinematics and Eye Contact on Action Perception in a Social Context

Kohinoor Darda
University of Glasgow, UK / Macquarie University, Australia

As human beings, a considerable proportion of our social behaviour is characterised by coordinating our movements with others. While a growing corpus of research indicates that engagement in movement synchrony is a hallmark of social and (pro-social) behaviour, how we perceive others interacting or moving together is less well-understood. Two aspects that appear to be critical to the perception of the social connectedness between others is gaze direction and movement synchrony. To explore how movement kinematics and gaze direction influence the perception of a dyad in action, we manipulate these two social cues in behavioural (N=49, 42 females) and neuroimaging experiments (N=20, 10 females). Behavioural data suggest that dyads are perceived as more socially connected and preferable to watch when they move synchronously and when they face one another. fMRI results show that parietal and occipitotemporal regions of the brain (the action observation network; AON) are engaged to a greater extent when watching dyads face each other rather than away from each other. This is consistent with prior evidence that suggests modulation of the AON by the degree of social interaction present in the stimulus (Oberman et al., 2007). Observing asynchronous movements showed greater engagement of right temporoparietal junction, precuneus, and right posterior superior temporal sulcus – regions commonly associated with perspective taking and visual transformations of the human body. This suggests that more inferential reasoning may be required when watching out of sync movements. Taken together, we show that the general direction of gaze as well as movement kinematics are important cues for establishing social relationship between moving dyads. These findings set stage for further investigation into cues that are important for perceiving a social relationship between two people, and how we might perceive the intentions of others who move together.

Establishing a Role of the Semantic Control Network in Social Processing: a Meta-analysis of Functional Neuroimaging Studies

Veronica Diveica
Bangor University, UK

A core question for the cognitive sciences concerns how we flexibly interact with others and coordinate behaviour to achieve mutually beneficial outcomes. The present study aims to shed light upon the cognitive control or regulatory systems that shape the way we interpret and respond to social interactions. Despite a general acceptance of the importance of control mechanisms for social competence, most leading models of socio-cognitive processing devote very little discussion to the precise nature and neuroanatomical correlates of their involvement. Recently, however, it has been proposed that a set of regions specialised for the controlled retrieval and selection of semantic information, namely the inferior frontal gyrus (IFG) and the posterior middle temporal gyrus, plays a key role in social cognition. We, therefore, set out to investigate whether the distributed neural activation commonly found in social functional neuroimaging studies extended to these regions. To this end, we conducted five large-scale coordinate-based meta-analyses to combine the results of over 500 independent fMRI/PET experiments using the Activation Likelihood Estimation approach. We identified the neural networks reliably involved in semantic control, as well as four social abilities, including theory of mind, trait inference, empathy and moral reasoning. This allowed an unprecedented parallel review of the neural networks associated with these cognitive domains. We observed that the left IFG (pars orbitalis) region involved in semantic control is reliably engaged in all four of the social domains. We found additional overlap between brain regions involved in semantic control, theory of mind, trait inference and empathy, specifically in the supplementary motor area and the right IFG. This finding supports the proposal that the neurocognitive system dedicated to the controlled retrieval and selection of conceptual knowledge is involved in processing of social information, and has implications for models of both neurotypical and disordered social cognition.

Do you see what I see? Individual differences in contextualized emotion recognition

Noga Ensenberg
Hebrew University, Israel

Recent evidence suggests that real life facial expressions are often more ambiguous than previously assumed. Accordingly, context plays an indispensable role in communicating emotion (see for example Aviezer, Trope & Todorov, 2012 ; Abramson, Marom, Petranker & Aviezer, 2017). In fact, even the recognition of stereotypical, exaggerated facial expressions can be shifted by context. For example, previous reports suggest that the body context in which a face is presented can bring to a categorical shift in recognition from the face (Aviezer et al. 2008). Other accounts have put forward different types of contexts such as the importance of knowledge of the situation (Carroll & Russell, 1996). The effects of context on the perception of emotion from the face have been studied extensively at the group level but are we all affected in a similar way? Here, we investigate whether such individual differences exist. We hypothesized that stable individual differences will be found, within and across different types of contexts, suggesting this to be an individual trait In our first study, using a multiple-choice categorization task, 101 participants were presented with still presentations of incongruent facial and bodily emotional expressions. We asked whether individuals differ in their tendency to rely on the bodily context when categorizing the face and if so whether effects are consistent over time. Striking differences in the tendency to rely on context were found between individuals. These were highly stable across two sessions ($r = 0.84$, $p<0.001$). Next, we asked whether individual differences hold also when using an open question paradigm. Here we tested 83 participants and found a robust correlation between the multiple choice and the open question paradigms, suggesting the individual differences found are not bound to a specific method ($r = 0.63$, $p<0.01$). In our third and last study, we presented participants with dynamic audio-visual expressions and studied the effects of context on 43 participants, asking whether the tendency to attend to the context holds even when the context is introduced across modalities. We found strong correlations ($r = 0.7$, $p < 0.001$) showing that individual differences in the tendency to relate to the context category hold even across modalities. We conclude that different people exposed to identical affective stimuli may perceive strikingly different emotions as a function of highly stable individual differences.

Journeys through the Uncanny Valley: Surrealism, Spectrality and the Future of AI
Ramona Fotiade
University of Glasgow, UK

This paper will explore the psychological and philosophical implications of uncanny experiences depicted in three iconic films which can be said to chart the evolution of humanoid robotics over two decades in the late twentieth-century: Andrei Tarkovsky's Solaris (1972); Ridley Scott's Blade Runner (1982); and Akira Kurosawa's Dreams (1990). These case-studies not only originate from different cultural backgrounds, but also share interest in unconscious processes which occur when the human intelligence is confronted with something alien or indeterminate. The French philosopher, Jacques Derrida, has theorised the phenomena arising at the frontier between binary opposites (presence and absence, life and death, visible and invisible) through the concept of spectrality, which initially referred to the uncanny effects of the 'tele-technologies' (production and circulation of real and virtual images, 'live' television, cinema) in the early 1980s. Derrida's theory of undecidability engaged with the Freudian notion of the uncanny from a perspective which resonated with the Surrealist search for the 'genuine functioning of thought' (beyond the traditional contradictions between the real and the surreal, the past and the present, death and life). The connection with death and resurrection, as well as haunting (which was part of Freud's original theorisation of the uncanny), comes up in Derrida's interpretation of photographs and moving images as a new type of being, which bypasses the binary logic of life versus death, presence vs absence. The spectre and the 'in-between' nature of its irruption into reality brings out according to Derrida, the intimate link between cinema and psychoanalysis. As he remarked in one of the interviews included in Ken McMullen's film, Ghost Dance (1983): 'Psychoanalysis plus film equals… a science of ghosts'. The three cinematic case-studies which I propose to analyse in this paper refer to the psychological evolution of human characters. Uncanny or 'in-between' entities which trigger these responses can be classified on a spectrum ranging from aliens (in Solaris), to highly evolved humanoid robots indistinguishable from human beings (in Blade Runner) and animistic externalisations of unconscious drives (in Dreams). The theory of the uncanny in relation to HRI will thus be reassessed in light of Derrida's theory of undecidability and spectrality for a revised ('post-humanist') understanding of what it means to be human in the age of virtual reality.

Linking Theory of Mind in Human-Agent Interactions to Validated Evaluations
Evelien Heyselaar
Radboud University, The Netherlands

There is a new crisis emerging in human-agent interaction research: Instead of using validated questionnaires, individual studies are creating new questionnaires to measure identical constructs. A recent review study identified 189 individual constructs (many measuring identical constructs), of which 79% were only used in a single study (Fitrianie et al., 2020). This means that it has become difficult to compare agents that are being used in different studies, more difficult to conduct replication studies, and near to impossible to conduct meta-analyses to determine which characteristics contribute significantly to creating a truly huma-like social agent. As part of the attempt to battle this crisis, we suggest the use of a Theory of Mind task to measure the implicit social behaviour users exhibit towards a virtual agent. Theory of Mind (ToM) is the ability to attribute mental states (beliefs, intents, desires, emotions, knowledge, etc.) to others and to understand that others have beliefs, desires, and perspectives that are different from one's own. This is the definition of what we want users to experience when they are interacting with an intelligent virtual agent. A human-human social ToM task has been published (the referential communication game; Vanlangendonck et al., 2016; 2018), showing behaviourally and via fMRI that this task taps into ToM networks. The goal of our study was two-fold: 1) Can the social ToM task be adapted for use with a virtual partner? and 2) Can we use the performance in this task to identify which validated constructs tap into this implicit measurement? For our first goal, 40 participants completed the task as expected: participants adapt towards the virtual agent more than when they conduct the task alone. This is similar to the human-human version of this task, although the amount of adaption was significantly less. This is not unexpected: our virtual agent was relatively basic. For our second goal, we attempted to correlate 7 validated constructs to the performance in the ToM task, using the data of 99 total participants. Our current results do not correlate significantly to the existing constructs. Data-collection is ongoing and hence no firm conclusions can be made about this second set of results. However, our data suggest that it is important to become aware that the existing validated constructs used in HCI research may not be tapping into what the researchers assume, and hence provide a basis for important discussions about these implications.

Domain-specific and domain-general neural network engagement during human-robot interactions

Ann Hogenhuis
Utrecht University, The Netherlands

An intricate collection of brain networks supports interactions between people. While some of these networks show distinct response profiles dedicated to specific tasks, for example understanding hidden mental states, other networks are domain-general and are active during a wide variety of tasks. In recent years, studies have begun to ask if these networks extent to other social agents and support engagement with robots. While most studies so far have been focussing on activity during the perception of robots in a small number of regions mostly within the social domain, a careful assessment of the functional architecture during real interactions with robots is warranted. In this exploratory study, we probe the similarities and dissimilarities in neural architecture during social interactions with a human and with a robot. We analysed a publicly available fMRI dataset (n = 22; Rauchbauer et al., 2019) in which participants conversed with another person or a robot. Incorporating the trial-by-trial dynamics of the interactions, listening and speaking, we used whole-brain and functional region-of-interest analyses to test response profiles within and across social or non-social, domain-specific and domain-general networks, i.e., the person perception, theory-of-mind, object-specific, language, multiple-demand networks. Whole-brain analyses showed that both interactions with another individual and with a robot resulted in similar and expected activation patterns across the language network and activated regions associated with language production and comprehension. While subtle differences emerged when contrasting speaking to a robot with speaking to a human, listening to a robot resulting in higher activation in areas associated with listening comprehension. These results were further supported by functional region-of-interest analyses whereby listening versus speaking led to increased activation in the language network during human-robot interaction compared to human-human interaction. While no differences were found in the theory-of-mind or the multiple-demand network, activity was increased across the person perception network and object-specific regions while listening to a robot compared to another person. Together, these results suggest that while similar regions are activated during communication regardless of the type of conversational agent, activity profiles during listening point to a dissociation at a lower-level or perceptual level, but not higher-order cognitive level.

Is mental state attribution to robots based on human-likeness?

Laura Jastrzab
Bangor University, UK

Prior research suggests that once a person attributes a mental state to another entity, they also endow that entity with many “human” qualities, including the ability to be a social partner. We readily attribute mental states to other people during social exchanges, but do we perceive robots similarly? Previous research shows that neural activity in regions associated with mentalizing increases with the human-likeness of game partner. Here, we aimed to replicate these findings. Forty adults underwent fMRI scanning while playing rock-paper-scissors with either another human, a humanoid robot, a mechanoid robot, or a random computer algorithm. Both robots have social features. The humanoid robot has a human-like form, speaks, and uses gestures with its arms. While the mechanoid robot has emotive eyes but no human-like form; it moves around on a table top, makes emotive noises, and uses some intelligible speech. Although participants believed they were playing games via a live-feed, pre-recorded videos were used to maintain equivalent wins and losses across participants and game partners. We only partially replicate previous findings. First, we found mentalizing regions of interest (ROIs) reliably deactivated during games with all partners. On the other hand, similar to previous findings, response in all mentalizing ROIs was significantly greater when playing against a human compared to playing with the robots or the computer. Surprisingly, however, brain response to the mechanoid robot either approached significance or was significantly higher than to the humanoid robot in nearly all mentalizing ROIs. Human perception of robots’ mental states holds important implications for how we interact with them. Indeed, the more we attribute a mind to robots, the more likely we are to meaningfully engage with them. We found mental attribution to game partners was not based on human-likeness. Our findings have the potential to influence robotic design, especially for robots designed to engage with us in social settings (e.g., education, healthcare, and the service industry).

Factors of variation of mere robotic presence effect

Loriane Koelsch
Gipsa-lab, France

The mere presence effect is the way how the presence of another human affects our capabilities, facilitating performances on easy tasks and impairing performances on difficult ones. This effect appears not only during an interaction but also during any tasks in presence of someone. If the mere presence of a congener is largely studying for a century, there are few studies showing that humanoid robots could have the same effect, facilitating performances on easy tasks and impairing on difficult ones.
Based on the literature of human mere presence effect, we will point the potential factors that could influence the effect of the mere presence of a humanoid robot on human cognition and try to discuss how they can take part in human robot interaction. Two categories of factors will be distinguished. The first one is the internal factors of the humanoid robot, the features that belong to its presence like the perceived robot gender or its personality. The second category is the robot external factors like an evaluative pressure or specific to the participant like its gender or technology familiarity.
Studying these factors can help to understand how the mere presence can be important in any interaction even with a robot and what kind of features should be taken in account to understand the mechanisms under human robot interaction.

Protocol for a Mediated Long-Term Experiment with a Social Robot

Guy Laban
University of Glasgow, UK

Social robots' cognitive architectures and embodied cognition can elicit socially meaningful behaviours and emotions from humans. Nevertheless, one of the challenges in human-robot interaction (HRI) research is replicating and extending novel findings, to better understand how short, constrained laboratory manipulations might translate to real-world scenarios. Since interactions with social robots are novel and exciting for most people, one particular concern in this specific area of HRI is the extent to which behavioural and emotional expressions might extend from initial interactions with a robot, when its novelty is particularly salient, and be sustained over time. One of the challenges of studying novelty effects in HRI is that HRI empirical studies are often limited to controlled laboratory settings due to various logistical (e.g., limited robots per lab, and robots' high price) and technical factors. Accordingly, HRI research struggle from receiving meaningful insights about long-term interactions with social robots in people's natural settings. As the current COVID-19 pandemic forced us into using computer-mediated means of communication (CMC) to interact with one another, these became standard means of communication in most households. Accordingly, we decided to use these methods to place a social robot in participants homes to study long-term HRI in natural settings. In this presentation, we are going to introduce a novel mediated online experimental design for studying novelty effects in long-term HRI. The experiment follows a between-subjects (i.e., interactions about Covid-19 experiences vs. general everyday experiences) repeated measures (i.e., 10 testing sessions across 5 weeks) experimental design. Forty participants were recruited via Prolific and were randomly assigned to one of the two conditions. Across a period of five weeks participants engaged in interactions with the social robot Pepper (SoftBank Robotics) via Zoom video chats twice a week. Participants were asked by Pepper about their general everyday experiences (e.g., their social life and daily activities) in the control condition. In the experimental condition, participants were asked the same questions by Pepper, however, these questions were framed in relation to the Covid-19 pandemic (e.g., social life during the pandemic, and daily activities during the pandemic). In each interaction, Pepper asked the participant 3 questions – one general small talk question, and two questions that correspond to one of ten randomly ordered topics. After each interaction participants answered a questionnaire. This study will provide critical insights into people's emotional disclosure and expression during HRI, and how this is impacted by time and content.

The impact of affective knowledge on the perception and evaluation of robot faces

Alexander Leonhardt, Martin Maier & Rasha Abdel Rahman
Humboldt-Universität zu Berlin
Cluster of Excellence "Science of Intelligence", Germany

Understanding facial expressions is a crucial aspect of human sociality. At a glance, we evaluate other people's faces to make inferences about their mental states and prepare ourselves for possible actions. As face-to-face interactions between humans and robots are set to become more frequent, there is now increasing interest in people's tendency to apply social cognition in interactions with robots. The present study builds on research showing that people read expressions into faces based on previous knowledge or assumptions that they hold about another person. We investigated whether and how affective information influences the interpretation of robot faces at different stages of processing. To this end, we analyzed relevant event-related potential (ERP) components gathered from EEG recorded during a rating task after participants had learnt positive, neutral or negative stories about 18 real humanlike robots. Affective information influenced judgments of robots' facial expressions and trustworthiness and modulated ERP components known to reflect visual processing and evaluation of human faces. Our results support initial evidence that expressions of robot faces are encoded similarly to human facial expressions and suggest that people read expressions into robots' faces as they would with other humans; people's interpretation of a robot face depends on prior knowledge about the robot. The present study will contribute to a better understanding of human-robot social interaction that can be used to successfully integrate social robots into people's private and professional lives.

The role of sexual orientation and sexual prejudice against gay men in the regulation of virtual comfort-distance towards artificial agents

Matteo Lisi
Sapienza, University of Rome; Italian Institute of Technology, Italy

The proxemics literature has long investigated the space maintained during social interactions and found that the separation zone that individuals keep between themselves and others (known as interpersonal distance, IPD) is automatically regulated according to distance-related feelings of personal comfort. Similar results have been found when participants interact with virtual confederates, suggesting that Immersive Virtual Reality (IVR) may represent a promising tool for investigating the IPD in an ecological and accurate way. Tellingly, the sex of the interactants seems to play a prominent role in the regulation of IPD. For instance, evidence shows that women dyads maintain closer distances than men dyads; however, this result has not been replicated in other studies. One of the possible reasons for the inconsistencies across studies could be the lack of consideration of other important aspects regarding sexuality. To explore this issue, 72 Italian participants, sorted into groups according to their sexual orientation (heterosexual/non-heterosexual) and their sex (men/women), performed a stop-distance task towards approaching male or female virtual avatars seen through an head-mounted display. Participants adjusted IPD using a joystick and had to indicate when they felt the IPD as comfortable. Through a continuous participant-avatar tracking, the distance (cm) at which participants stopped the virtual avatar was calculated. Participants' levels of implicit and explicit sexual prejudice against gay men were also collected. Bayesian analyses showed that same-sex IPD was smaller for non-heterosexual compared to heterosexual participants. Moreover, only in the group of heterosexual men, the implicit prejudice against gay men was associated with a larger distance towards the male avatar and a closer distance towards the female avatar. These results suggest that among heterosexual men, higher levels of implicit prejudice are associated with enhanced perceived threat during spatial interactions with other men and are also associated with enhanced need of reducing distance with women, probably in the attempt to maintain cultural ideals of masculinity and appropriate gender roles for men. Furthermore, our findings support the idea that considering only biological sex gives a limited account of IPD regulation since there are within-sex differences dependent on sexual orientation. Overall, our approach suggests that IVR may allow to overcome limitations typical of studies with real participants and provide a unique opportunity to explore the physiological and neural underpinnings of sexuality-related variables that regulate IPD.

An Online Investigation of the Effects of Autistic Traits and Cultural Orientation on Robot Expression Interpretation

Peter McKenna
Heriot-Watt University, UK

Adults with an autism spectrum condition (ASC) experience disproportionate levels of unemployment due in part to social interaction challenges. A potential technological solution to this would be to deploy robots as social skills training partners. Currently, robots are being deployed as social interaction partners for children with an (ASC) because they can be programmed to behave predictably and designed to include simplified, recognisable features. Whether robots could be deployed in a similar manner - either as virtual agents or embodied robots - with adults is an open question. To investigate we have designed and validated a set of recognisable robot facial expressions with an EMYS head (https://emys.co/index.php), that convey either approval or disapproval. Our paradigm is inspired by the cognitive appraisal theory of emotion: that emotions are the result of an individual's appraisal of an event with respect to their goals (i.e., positive affect is evident when events favour goals and negative affect when they are mismatched). In our online survey-based study participants appraise videos of EMYS facial expressions when the expression either matches or mismatches the context (i.e., are either congruent or incongruent). The context is workplace social phenomena considered especially challenging by employed adults with an ASC (e.g., time management) and are displayed as a series of vignettes depicting interactions between human boss and robot employee. Participants will include adults with an ASC and neuro-typicals (NTs). We will measure their autistic traits and cultural orientation as previous work has demonstrated that these factors affect robot expression recognition. We base our hypothesis on preliminary pilot work. We expect that adults with an ASC and NT adults with high levels of autistic traits (the target group) will show greater variance in their interpretation of the robot's facial expressions relative to NT adults with medium or low autistic traits (the control group). For example, we expect controls to identify incongruent expressions with greater accuracy, as our pilot data indicate higher accuracy in this condition relative to congruent vignettes and expressions. Inclusion of a cultural orientation questionnaire will also allow us to assess whether individualist or collectivist orientations affect expression interpretation. This work contributes investigations of social signal processing of robot facial expressions for both ASC and NT adults, as well as offering greater insight to the nature of work-related challenges faced by adults on the spectrum.

Choices, uncertainty and freedom threat

Noelia Mejía Wille
Behavioural Science Institute, Radboud University, The Netherlands

Supervisors: Prof. R.W. Holland, Dr B.C.N. Müller, MSc I.A.M. Verpaalen

Psychological reactance research has shown that controlling communications increase freedom threats, and as a consequence arouse reactance (for reviews see Rains, 2013; Rosenberg & Siegel, 2018). However, research which has investigated such freedom threats usually assumed that people were always certain about their choices. Nevertheless, certainty when making decisions varies. In an Immersive Virtual Environment (IVE), we manipulate freedom threat by low versus high controlling language crossed with a manipulation of certainty of decisions (within subjects). Our project investigates whether uncertainty moderates the causal relation previously found between freedom-threat and reactance. The project is the first, to our knowledge, in psychological reactance research to use a within-subject manipulation of certainty and to derive certainty as the degree of confidence a person has on a choice during the process of value-based decision making. We assume that uncertainty (derived from low confidence in a choice) decreases the freedom-threat perception resulting in low reactance and increased conformity with an advice. In other words, we think that when people are uncertain, they become more open to advice, independent of the degree of controlling communication, since the advice can be a source of gaining certainty when making a decision. Therefore, our study could provide evidence for cases when freedom-threats that limit our behaviour can be beneficial. In our study, participants first assigned subjective-value to 116 snack items. The snacks are ranked and idiosyncratic certain and uncertain snack pairs are computed. Then, the computed snack pairs are presented in a cafeteria IVE. On critical trials, participants are presented with one snack-pair at the time and they 1) make a pre-selection, 2) hear a request to change their pre-selection from one of four avatars functioning as a freedom-threat, and, 3) make a final selection. Two avatars give low-controlling communication (e.g., “Perhaps you could choose that one”) and two avatars give high-controlling communication (e.g., “You should choose this one”). As measure of conformity with the advice is the decision on the final selection in agreement with the advised option by the avatar. After the IVE task, self-report questionnaires are administered asking for perceived freedom-threat and reactance. Additionally, self-reported reluctance to cooperate and co-presence in the IVE and memory of the avatars are assessed. At the moment, we are in the data analysis phase of the study and are confident to finish the analysis by the end of May.

Non-verbal Mimicry Decreases Resistance During Interactions with Intelligent Virtual Agents.

Barbara Müller
Radboud University Nijmegen, The Netherlands

Developments in virtual reality (VR) technology are proceeding rapidly, with intelligent virtual agents (IVA) that are, for example, used as counsellors [e.g.,1]. People can, however, feel threatened by an artificial agent [2], which might lead to defensive responses and an increase in undesirable behaviour, such as psychological reactance [3], resulting in less pleasant interactions. One way to avoid such defensive responses is by making the IVA behave in a very human-like way [4]. Research has shown that humans mimic each other's movements during interactions [5] which has been shown to improve interactions and liking in human beings [6]. Mimicry of head movements in human-IVA interactions has likewise improved evaluations intelligent virtual agents [4], while psychological reactance decreased [7,8]. The aim of the present study was to answer the question whether people evaluate an IVA more positively when this agent non-verbally mimics its interaction partner. More specifically, we looked at how convincing the IVA was perceived, whether participants disbelieved or trusted it, and whether not being mimicked led to more resistance towards listening to the IVA. Seventy-one undergraduates (46 female, aged 18-41 years, M=22.93, SD=3.82) from Radboud University participated. They were introduced to a photograph description task, in which they and a female IVA took turns to describe 12 photographs to each other. In the Mimicry condition (N=37), the experimenter controlled the movements displayed by the agent (e.g., changing body posture, nodding), making the IVA imitating the participants with a few seconds delay. In the Non-mimicry condition, participants interacted with an agent that exhibited a pre-programmed set of movements. Subsequently, the dependent variables and demographics were assessed. Results show that differences were non-significant for participants' ratings of the IVA's Trustworthiness and Disbelief, p's>.20. However, participants in the Mimicry condition found the IVA more convincing (M=5.14, SD=0.89) than in the Non-mimicry condition (M=4.65, SD=1.10), $F(1,68)=4.225$, $p=.044$, partial $\eta^2=.059$. In addition, participants in the Mimicry condition felt less resistance towards the IVA (M=1.53, SD=0.65) than participants in the Non-mimicry condition (M=2.12, SD=1.15), $F(1,68)=7.072$, $p=.010$, partial $\eta^2=.094$.
In conclusion, this study, explored whether being mimicked by an IVA influences the evaluation of that agent. Participants found the mimicking IVA more convincing and felt less reactance towards it compared to a non-mimicking one. Our study shows that non-verbal mimicry can be used to improve VR applications and can positively influence the evaluation and believability of IVAs when interacting with humans while decreasing human resistance.

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Virtual Cues can be Social Cues: insights from a social decision-making paradigm

Lorenzo Parenti
Istituto Italiano di Tecnologia (IIT), Italy

Decision-making processes occur continuously in our everyday life when we interact socially with others [1]. Although social decision-making (SDM) has received increasing interest in recent years, the influence of certain communicative components, such as social cues and feedback, on decision making is still poorly understood [2]. One explanation to why social decision-making has yet to be examined thoroughly is the difficulty of examining social parameters in highly controlled settings [3]. As such, artificial social agents provide a platform to overcome this issue due to the fact that they are able to elicit a wide range of behaviors and attitudes during interaction, while controlling for other unwanted social parameters (e.g., the effect of perceiving a human face) [4]. This study aims to examine how robot social cues and feedback affect people's performance and whether they are still perceived as social signal in a virtual context. Participants completed an online 2-alternative forced-choice task where they tried to find a target. In a between-subject design, we manipulated the validity of the cue provided by the robotic virtual agent and whether the agent gave a positive social feedback following hits. Preliminary results suggest that the agent's social signals affect participants' performance in terms of following rate and reaction times (RTs). In particular, participants receiving social feedback were slower that the other groups, indicating that additional cognitive processes might be engaged. We also conducted a control condition where the cues were given by a flashlight instead of a virtual agent. Interestingly, participants showed a different behavioral pattern between the Robot and the Flash conditions only when the feedback was provided by the virtual agent. Generally, the results indicate that using a virtual agent can be beneficial to examine human performance as it relates to social decision-making. Future works will aim to extend this experimental framework with an animated virtual avatar.

Who is my interlocutor? Partner-specific neural representations during communicative interactions with human or artificial task partners.

Doris Pischedda
Charité - Universitätsmedizin Berlin, Germany

When speaking, language production is adapted to the specific conversational partner (e.g., Brennan & Hanna, 2009). Partner-adapted language production has been associated with the skill of taking another person's perspective (i.e., mentalizing; e.g., Frith & Frith, 2006). This ability is supported by a brain network composed mainly by ventromedial prefrontal cortex (VMPFC), temporoparietal junction, and inferior frontal gyrus (Molenberghs et al., 2016). Partner-adapted speaking requires high flexibility. Previous studies in cognitive neuroscience have shown that the brain supports flexible behavior by pre-activating the cortical structures needed to perform the upcoming task (e.g., Pischedda et al., 2017; Sakai & Passingham, 2003). These task sets are characterized by neural activity reflecting preparation for the upcoming task, localized mainly in ventrolateral prefrontal cortex (VLPFC; Pischedda et al., 2017; Sakai & Passingham, 2003) and parietal cortex (e.g., Pischedda et al., 2017). By analyzing brain activity during preparation to speak, a recent study (Kuhlen et al., 2017) demonstrated that VMPFC and VLPFC encode information about the intention to speak to a conversational partner (a human confederate) as compared to without having a conversational partner (to test a microphone). This speaks for an involvement of mentalizing when speaking to a human partner. In everyday communication, computers are becoming frequent conversational partners, for example, as dialogue systems, agents, or humanoid robots through language and speech recognition interfaces (e.g., Wachsmuth & Knoblich, 2005). Social cognitive neuroscience can therefore investigate at a neural level whether communicating with artificial agents is similar to addressing human conversational partners (see, e.g., Rauchbauer et al., 2019) in order to build more usable systems (Branigan et al., 2010). In this study, we investigate partner-specific neural representations while conversing with different task partners: a human, a humanoid robot, or a computer. We recorded functional magnetic resonance imaging data while participants and their task partners worked together on a spatial task over an online Zoom interaction. On each trial, the participant instructed one of the partners to perform an action and observed the outcome of the partner's action on the screen. We use multivariate pattern analysis to identify brain regions containing information allowing for decoding different communication partners when preparing to speak. We predict that both VMPFC and VLPFC encode information about the specific task partner that is addressed, with a differential involvement depending on the human-likeness of the communication partner. Data collection and analysis are currently ongoing. First results will be presented at the conference.

“Hit the Robot on the Head… with this Mallet” - Making a Case for the Importance of Open Questions
Katie Riddoch
University of Glasgow, UK

To quantify the extent to which we perceive robots as social agents, opposed to objects, researchers have employed tasks in which they ask participants to inflict ‘harm’ to a robot. The length of time between being given the instruction and complying (termed “hesitation”) is measured. Researchers have proposed that relatively long periods of ‘hesitation’ might reflect empathy for the robot. In a recent experiment (n=84), we adapted a version of this paradigm in which participants were instructed to hit a humanoid robot on the head with a mallet. After agreeing to do so, participants were halted, then a semi-structured interview was conducted to probe thoughts and feelings experienced during the period of hesitation. Preliminary analysis of the responses indicate that participants’ hesitation not only reflects perceived socialness - but other factors including (but not limited to) concerns about cost and the influence of authority. Participants’ responses also offer insight into individual differences with regards to anthropomorphism and feelings of connection towards the robot. In addition to aiding understanding of this measurement technique and related topics, we argue that other types of research would also benefit from more qualitative insights. We also suggest that the words of participants could bridge gaps between robotics researchers, the general public, and those working on creative projects to engage and inspire a broad range of people with social robotics technology.

Interpretations of virtual agent performances of metaphoric gestures differ across cultures
Carolyn Saund
University of Glasgow, UK

Co-speech gestures of the hands transform mental constructs into physical forms and actions, and are widely shown to play a powerful role in face-to-face interaction. Our interest lies specifically in metaphoric gestures, which embody abstract concepts and reflect the relationship between thought, speech, and motion. These gestures not only increase speaker interpretability and viewer comprehension in both humans and virtual agents, but importantly can alter how the viewer qualitatively understands information presented by the speaker. Gesture behavior and interpretations of some gestures differ across cultures. For instance, emblematic gestures, such as the “thumbs-up,” are entirely culturally dependent. Similarly, frequency and amplitude of gesture performances vary widely across cultures. However, metaphoric gestures ground abstract concepts in physical motion. By the Embodied Cognition hypothesis, interpretations of these gestures may therefore be consistent across cultures, as all individuals experience the same physical world. Similar interpretations of the same metaphoric gestures would imply the same conceptual metaphors are driving gestures in individuals from different cultures. By decomposing metaphoric gestures into physical components, we hope to use cross-cultural interpretations of combinations of these components as a tool to study the potential for universality of physical embodiment of abstract concepts. Our interest is in modeling both the underlying processes that go from mental construct to gesture, as well as in modeling the perception of the behavior, specifically how those gestures then influence observers. We can in turn use the assessment of the latter perceptual model’s effectiveness in an interaction to determine a virtual human’s generation model, leading to more effective virtual human performances. The presented study focuses on a key step along this path, the perception of metaphoric gestures. In this crowd-sourced study, we present metaphoric gestures with origins in American and Japanese speakers to viewers of each culture and ask viewers to self-report interpretations of abstract notions seen in these gestures. These notions were gathered using thematic analysis of free-response interpretations of these gestures. Results from human studies indicate that interpretations of abstract notions that may be represented by these gestures, such as conflict and togetherness, differ significantly across cultures. This indicates that embodied signifiers of these concepts differ both between individuals and cultures, discouraging the idea of a universal mapping from physical motion to abstract concept.

Reduced body ownership increases dishonesty: evidence from an immersive virtual reality study.
Marina Scattolin
CLN2S@Sapienza, Italian Institute of Technology (IIT), Italy

Despite an increasing interest regarding how moral behaviour may change during virtual interactions, the question of whether the feeling of ownership towards a virtual avatar may bias moral decisions towards dishonesty – e.g. through increased reward sensitivity – or honesty – e.g. through increased sense of responsibility – remains unanswered. Here, we tested if the Sense of Body Ownership over a virtual avatar influences the tendency to act immorally and whether this tendency is modulated by the monetary reward associated with cheating. We employed fully immersive virtual reality and asked participants to complete the Temptation to Lie Card Game, a task that fosters the temptation to lie to increase one's own monetary gain. Online motion capture ensured real-time control over the movements of an avatar. We manipulated the Sense of Body Ownership by asking participants to observe their avatar from a first person perspective, with hands attached (Full body condition) or detached from the body (No Wrist condition), or from a third person perspective (Out-of-body condition). We found that ownership ratings were reduced only in the Out-of-Body condition, during which high rewards were associated with more egoistic lies in comparison with low rewards. In addition, altruistic lies increased with low rewards in the No Wrist condition. We argue that mere visual body discontinuity may lessen the tempting value of small rewards, while reductions of the Sense of Body Ownership may facilitate immoral behaviour, possibly by blurring the connection between the body and the self and facilitating separation from the consequences of immorality.

Taking turns (with a computer): Joint goals affect attentional orienting
Laura Schmitz
Leibniz University Hannover, Germany

When two people take turns reaching to spatial locations, it takes them longer to reach to the location their co-actor previously reached to as compared to a different location. This effect, termed the "social inhibition of return" (sIOR; Welsh et al., 2005), is typically explained in terms of an evolutionary account which states that it is adaptive to orient one's attentional and response behavior towards novelty – and therefore to inhibit the return of attention and action to locations just visited by another person. In the present study, we asked whether this typical inhibitory behavior (1) also occurs if people act together with a virtual agent (i.e., a computer program) and (2) is modulated if people act jointly with that virtual agent (i.e., if they share a joint goal). Participants were informed that they would take turns with a "virtual partner" in responding to a cue that appeared at one of two possible target locations on a computer screen. In the "individual goal condition", the target always turned blue upon the participant's response and yellow upon the virtual partner's response. In the "joint goal condition", participant and virtual partner shared a joint goal, namely to blend their two colors by responding sequentially to the same target. Thus, whenever the participant responded to the target the virtual partner had previously responded to, the target turned green (yellow + blue); the joint goal was achieved. We found that (1) participants showed the typical sIOR effect in the individual goal condition and (2) this effect was significantly reduced in the joint goal condition. Further experiments investigated to what extent this modulation depended on (a) the framing and presence of the joint effect and (b) the type of joint goal. Together, the present results demonstrate that the sIOR effect occurs even if people interact with a computer program and that it is substantially modulated if people share a joint goal with the computer, indicating that joint goals can shape people's basic attentional orienting and response behavior.

Smart conversational agents for the detection of dementia: A systematic review

Christina Simoudi
Panteion University of Social and Political Sciences, Greece

Introduction

Dementia is a neurodegenerative disorder and affects patients' daily functioning due to severe deficits in memory, time or/and place orientation, language, and executive functions. More than 40 million people worldwide suffer from Alzheimer's disease, which is the most common type of dementia, and the number is expected to increase drastically in the coming years. Therefore, early detection of dementia is of utmost importance in order to slow down the progress of the disease. Useful tools for diagnosing dementia could include intelligent virtual agents (IVAs) or automatic analyses of conversational speech. The main objective of this review, therefore, is to portray the potential of conversational technology in dementia detection.

Methods

The literature review was conducted using the databases of PubMed and Cochrane, which were searched from inception up to 2021. The search keywords were: "dementia" OR "Alzheimer's disease" AND "diagnosis" OR "detection" OR "assessment" AND "virtual assistant" OR "virtual agent" OR "embodied agent" OR "avatar" OR "virtual conversation". In our review, we included studies with patients with dementia and, taking into account the novelty of the topic, we decided to include conference papers, using ResearchGate, as well. The exclusion criteria were papers focused on therapy or other clinical samples, and review papers.

Results

The initial search yielded 240 results. After duplicate removal, screening the title and abstract of the articles, and applying the inclusion and exclusion criteria, 6 papers were relevant to dementia diagnosis via intelligent conversation assistant. In all 6 articles, specific language features (e.g., lexical, acoustic) were used for the detection and 5 papers, except 1, employed IVAs. The results demonstrated that the used systems effectively detected patients with dementia and also differentiated patients with neurodegenerative dementia (ND) from patients with functional memory disorder (FMD), with accuracy reaching ≈ 90% in the majority of articles considered. Moreover, this level of accuracy was independent of whether an IVA or an automatic conversational analysis was employed for the detection.

Conclusions

The aforementioned results demonstrate that IVAs can potentially detect dementia with high accuracy. However, the studies are, as yet, few in number and lack validation. Further research in this promising field seems necessary with an added focus on how IVAs could be used for prevention and treatment of dementia.

Social roles for artificial systems

Anna Strasser
DenkWerkstatt Berlin, Germany

Soon we will share a large part of our social lives with various kinds of artificial systems. Several factors contribute to a similarity between human-machine interactions and human-human interactions. For example, our behavior towards artificial systems is shaped by our tendency to anthropomorphize as well as by our ability to generalize (Darling 2016). However, our behavior toward artificial systems can also influence how we behave among humans. Consequently, we should be prepared that some human-machine interactions will not only be part of our social life but also have the potential to change interpersonal interactions. In human societies, many behavioral rules are specific to particular social roles; pronounced characteristics help us avoid inappropriate behaviors toward specific role holders. Regarding artificial systems, we lack pronounced characteristics supporting fine-grained differentiations. Moreover, similarity to human-human interactions seems to be a desired goal since it is an important objective of social robots that artificial systems should enter the human space of social interactions. This can result in desirable but also disastrous transfers of behavioral patterns established in human-machine interactions to interpersonal interactions. For example, interactions with sex robots may promote the ubiquitous idea that even living women are sex objects and thereby contribute to increasing physical and sexual violence against women (Cox-George & Bewley 2018). Investigating to what extent such transfers happen to be automatic and are out of our control, this talk explores whether we can introduce features into human-machine interactions that help us recognize them as carrying a particular social role as distinct from human ones. To this end, potential changes regarding our attitude towards artificial systems as well as potential new designs of artificial systems will be discussed.

The Processes Supporting the Perception of Social Robots

Emmanuele Tidoni
University of Hull, UK

Do we perceive humanoid robots as mechanical humans or humanlike objects? An integral part of introducing social robots into social spaces, such as the home and community, is their acceptance by people at first sight. Although we may rely on human-like features to perceive other people as agents, to date, only a limited set of studies has addressed this question comparing robotic and human bodies. We recently concluded a series of pre-registered behavioural studies at www.AsPredicted.org. We indexed participants tendency to perceive humanoid robots as either human agents or as objects. In particular, based on previous studies related to body observation, we developed a match-to-category task1. Participants observed a picture of a target Agent (human or humanoid robot) or a target Object (object-tool, object non-tool) for 150ms. After visual mask presentation (500ms), two different pictures appeared, one within the same target-category, and a distractor. Participants were asked to perform a two-choice match-to-category visual discrimination task, in which they decided which of two pictures matched the target's category seen previously. For example, if the target picture had been a human agent, then participants may have observed a humanoid robot and a different human body. Importantly, objects-tools and objects-non-tools were controlled for graspability and capacity to extend the human body, and robotic bodies had the same orientation and form as human bodies (two upper and lower limbs). We found that robotic bodies interfered with the processing of human bodies as well as non-tool objects. Contrary, human bodies did not interfere with the processing of robotic bodies and objects (object-tool, non-tool objects). Results suggest that neural circuits processing robotic bodies may rely also on brain mechanisms specialized for processing both human bodies (e.g. extrastriate body area) and inanimate objects (e.g. lateral occipital cortex, LO).

Mimicking virtual "person" makes you more social: A virtual reality study on how mimicry influences communion characteristics.

Weronika Trzmielewska
Univeristy SWPS in Warsaw, Poland

People's self-perception is organized into the two meta-traits: agency and communion. Agentic persons define themselves in relation to own achievements, whereas communal individuals tend to define themselves as related with others (e.g.,1). According to these meta-traits, any social interaction involves two perspectives, in the dual-perspective model of agency and communion, the agent perspective refers to a person who performs an action, whereas the recipient is experiencing others' actions (2). An individual's self-perception, however, is no static trait but may be susceptible to information about their connection with others. Signals of such connectedness can be, under more, mimicry (3). Mimicry is the automatic imitation of an interaction partner's behaviors (4), and fulfils an important social function because it bonds people by creating a generally prosocial orientation (5). This bonding effect is also observed between humans and virtual agents in virtual reality (VR) environments (6).
The current study aims to complement theoretical concepts concerning mimicry and self-perception, which is in this study measured on communion and agency and recipient and agent perspective. As the behaviors of virtual agents resemble human behaviors (7), effects on self-perception processing in VR should be comparable to effects during human/human interaction3. Based on previous research, we expected that mimicry by a VR agent should elicit the tendency in participants to define themselves as more communal and increase the likelihood of taking the perspective of the recipient (8). Participants (N=71) performed a picture-description task in a VR environment, while being mimicked (i.e., the experimenter triggered the respective movements to be displayed by the VR agent with a time delay) or not being mimicked (the VR agent showed pre-programmed movements irrelated to the participants behavior). Subsequently, they completed self-report questionnaires. Participants in the mimicry condition perceived themselves as more communal (M=5.66, SD=0.50) compared to the no-mimicry condition (M=5.28, SD=0.56), $F[1,69]=9.55$, $p=.003$, $\eta p2=.12$. All other effects were not significant.
In this study, we investigated if behavioral mimicry by a virtual agent influences people's self-perceptions of agentic/communal traits, and their tendency to take the agent's or recipient's perspective. Mimicry by a digital agent only increase feelings of communality in participants.. In sum, it seems that VR technology may be a valuable tool to investigate the bonding effect of mimicry in highly controlled environments. Our findings may help understanding and improving virtual agents' human-like behaviors.

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How data source influences the perception and uptake of algorithmic advice

Afroditi Tsourgianni
UCL, UK

The way algorithms are integrated into our everyday decision-making process depends on a variety of factors, one of them being the way people perceive AI. Here, we focus on the systematic differences in how algorithms and human advice is perceived and evaluated by exploring the cognitive mechanisms that shape how people expect human and algorithmic judgment to differ in terms of their input, process and output.As such, we aim to contribute to research that explores algorithm perception and the difference between algorithmic and human advice uptake. In study one, we explored choice and the role of algorithmic advice in a subjective task (selection of a coffee blend) when compared to advice coming from other similar people. The advice came after the participants made an initial choice, allowing us to measure sway (choice change) and validation (no change).
We find that people seem to be indifferent to the source of advice since they are not swayed (choice change) by either humans or algorithms, but algorithmic advice acted as a better choice validator compared to social advice. This differs from the research on subjective tasks that finds people are less likely to rely on algorithmic advice compared to human advice (Castelo, Bos, & Lehmann, 2019; Jussupow, Benbasat, & Heinzl, 2020). There are a couple of things that could potentially account for our results, including the framing that we used in this study for the algorithm; it highlighted the algorithm's data source as personalised coffee quiz results. This type of self-relevant input data to the algorithm might have boosted algorithmic validation of choices, compared to non- self-relevant information. Future research will further test the impact of the source of input information on algorithmic advice uptake.

The Unfolding of Resistance to Persuasion in Immersive Virtual Reality

Iris Verpaalen
Radboud University, Behavioural Science Institute, The Netherlands

Virtual agents are increasingly employed to change human behaviour. Their advice is meant to change habits or to persuade people to act, but how do their messages affect behaviour? Can agents also evoke resistance? Psychological Reactance Theory (PRT) is a central theory in social psychology. It explains that pressuring persuasive messages unintentionally raise resistance because they are experienced as threat to personal freedom. However, it remains unknown whether PRT can explain people's responses to directive advice from virtual agents. Moreover, little is known about the within-subjects dynamics of reactance; how it develops during an interaction, and to what extent people change their initial decisions when exposed to repeated freedom threatening change requests. This study aimed to gain a deeper understanding of how reactance unfolds in a virtual social context, by studying recurring human-agent interactions. To be able to address dynamic behaviour change, we developed a novel experimental approach: the Repeated Investment Choice Paradigm. This paradigm structurally measures resistance to social pressure in an immersive virtual environment. In this pre-registered experiment, 40 participants made 64 real-outcome monetary investments by choosing between two investment options. Freedom threat was manipulated within-subjects with change requests from multiple virtual agents, presented as investment partners standing next to the participant. They either gave low-controlling or high-controlling advice (e.g. by saying "Perhaps you can choose X" vs. "You must choose X"), and agreed with the participant on control trials. Participants could then confirm their initial preference or go along with the advised investment. Additional measures per agent included self-reported freedom threat, reactance, fear, and willingness to collaborate again. Our findings confirmed that, as in human-induced freedom threat, reactance arises in both experience and behaviour. That is, high-controlling avatar advice increased reported freedom threat, reactance and fear, as well as the proportion of choices for initial personal preferences. It decreased willingness to collaborate later. The repeated-decisions structure allowed us to explore how soon non-compliance with advice occurs, and showed that reactance striving unfolded straight away, and remained stable over the multiple decisions. Thereby, we extend PRT and create more precise behavioural predictions. More broadly, the new paradigm demonstrated an efficient social influence manipulation in a virtual social context. This indicates the potential of this human-agent approach for controlled experiments to the development of reactance in consequential decisions, e.g. in combination with psycho-physiology or by structurally varying threat manipulations, as we currently explore in follow-up experiments.

Humans share task load with a computer partner if (they believe that) it acts human-like

Basil Wahn
Department of Psychology, Leibniz University Hannover, Germany

In the near future humans will increasingly be required to cooperate and share task load with artificial agents in joint tasks as they will be able to greatly assist humans in various types of tasks and contexts. In the present study, we investigated humans' willingness to share task load with a computer partner in a joint visuospatial task. The partner was described as either behaving in a human-like or machine-like way and followed a pre-defined behaviour that was either human-like or non-human-like. We found that participants successfully shared task load when the partner behaved in a human-like way. Critically, the successful collaboration was sustained throughout the experiment only when the partner was also described as behaving in a human-like way beforehand. These findings suggest that not only the behaviour of a computer partner but also the prior description of the partner is a critical factor influencing humans' willingness to share task load.

Robots facilitate human language production

Olga Wudarczyk
Humboldt Universitaet zu Berlin, Germany

Recent advances in artificial intelligence have introduced autonomous and human-like robots into many spheres of daily life. With the rising presence of social robots, it becomes critical to understand whether robots' actions, in social interactions with humans, are simulated and predicted or in other words co-represented. Here, we assessed the extent to which robot's verbal actions, in a joint task, are co-represented, and explored the consequences of robot verbal co-representation on human language production. Thirty-six participants took turns in naming semantically related objects together with a social robot (Pepper, Softbank Robotics). It has previously been observed that naming semantic categories together with a human partner leads to inhibitory effects on subsequent naming, suggesting internal simulations on behalf of the partner down to the level of lexical access. In the current experiment, with a robot partner, we observed facilitated naming of objects belonging to word categories co-named with the robot. This facilitation effect suggests that robots, unlike humans, are co-represented at the early level of language production where the meaning of the verbal message is generated, resulting in facilitated language production due to conceptual priming. These results suggest that robots facilitate conceptualization processes as humans transform thoughts to language during speaking. The facilitatory effects of robot verbal co-representation on language production observed in the current experiment are of special importance in contexts where language production enhancement is desired: our findings suggest that verbal interactions with robots in these contexts might be advantageous in facilitating spoken language production.

It is time to laugh: Learning Co-Occurrence of Laughter and Topics in Conversational Interactions

Joni Zhong
The Hong Kong Polytechnic University, Hong Kong

Laughter is a typical social behaviour, commonly associated with joking and humour, and it serves a broad range of interaction functions. For instance, it can be a sign of politeness and socially acceptable behaviour in casual situations. Also, it can also occur in connection to socially critical situations to reduce psychological tension or embarrassment. How do different types of laughter happen in a conversation? In this study, we studied the co-occurrence between the types of laughter with the conversation contents. The conversation content was obtained from a dialogue corpus consisting of an Estonian video corpus of first encounter dialogues. In this first encounter context, the participants were instructed to get to know their partner in a short conversation as they might do at a party or a reception. The occurrences of laughter are first divided into free laughs and speech-laughs, and further into 5 subtypes. Neural models were then used to learn and predict the types of laughter based on the contexts of the conversation. At the first experiment, a neural model consisting of word embedding and recurrent neural model is used. The results showed that there exist a co-occurrence relation between the semantic value of the topics of the conversation, represented by the embedding model, and the types of laughter. Assuming that the types of laughter also co-occurs with specific words, as well as a certain pause, in the conversation, we further extended our model with attention mechanism. The result showed that certain words, as well as the pause in the conversation, may play as an important indicator as specific types of laughter.

If you trust me, I will trust you: the role of reciprocity in human-robot trust

Joshua Zonca
Italian Institute of Technology, Italy

Trust is an essential component of human-human and human-robot interaction. Decades of behavioural research have shown that trust among humans is a relational phenomenon sustained by reciprocity. However, research in human-robot interaction mainly conceptualised trust as a one-sided process of evaluation of robot competence and reliability. Here we hypothesise that reciprocity may play a key role in the establishment of (mutual) trust in human-robot collaboration. In a novel experimental paradigm, 50 participants made visual perceptual judgments and believed that either a humanoid robot iCub (Robot group) or a computer (Computer group) was doing the same. Participants received trial-by-trial feedback on the estimates of their interacting partner (robot or computer), but not on their respective accuracy. In some trials, after observing the partner's response, participants could adjust their estimate by placing a final decision between their own and their partner's estimate (i.e., trust judgment), providing an objective measure of explicit trust towards the agent. In other trials, trust judgments were made only by the partner, whose behaviour was dynamically manipulated along the experiment to express different levels of trust in the participant. Results of the Robot group reveal that participants implicitly lose trust in the robot's competence when the robot was showing high trust in them. In particular, participants stopped to use the robot's perceptual feedback to improve their own performance, although their accuracy was markedly lower than that of their robotic partner. Nonetheless, the observed loss of implicit trust in the robot was not associated with a decrease in the explicit trust expressed during participants' trust judgments. In particular, participants did not want to reveal to the robot their distrust as long as they expected future interactions with their partner, suggesting the emergence of reciprocity in the overt expression of trust towards the robot. These effects were absent in the Computer group, in which both implicit and explicit trust perfectly covaried with the perceived competence of the partner. Altogether, our results offer novel insights on the reciprocal dynamics underlying mutual trust in human-robot interaction. These findings may have an impact on the design of robotic agents that could effectively collaborate with humans in contexts such as healthcare, assistance and education.

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